



WP/20/02

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# SPRC Working Paper

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## **ABSTRACT**

The life span in Pakistan has also increased with the life expectancy rate across the world. The growing older population also increases the demand for health services because the risk of disease and disability increases with the age. The major concern for the policy maker is to explore the way to extend the quality and years of life to promote the healthy ageing. This paper explores the determinants of healthy ageing for older people in Pakistan. The healthy ageing score was predicted by using Confirmatory Factor Analysis (CFA). After the construction of common variance among the sets of indicators the Mean Decrease Accuracy (MDA) was estimated through random forests in order to quantify the importance of variables in predicting healthy ageing. The results of the study clearly demonstrate that three determinants including functional disability, property ownership and social participation are strongly associated with healthy ageing. The results implies that healthy ageing can be promoted by strengthening the role of health care, social security, social insurance and by enhancing community participation of older people. In addition, there is also need to encourage the ownership of financial assets or resources for older people to meet their basic needs and independent livelihoods.

**Keyword(s):** Healthy Ageing, Older Population, Life Expectancy Rate

**JEL Codes:** I12, J14, J18

## 1. Introduction

The world population is going toward ageing since life expectancy has increased with the average of 5 years. Now people can enjoy their life till 60 years and above. With the growing age the risks of disability and non-communicable diseases also increased. As the population is going towards ageing so the major concern for the policymakers is to explore the way to extend quality as well as years of life. Many nations are responding this challenge through the development and implementation of policies to promote the healthy ageing (Gohar & Sabzwari, 2011). The term healthy ageing is used broadly in policy circles and academics. It is basically used to recognize Disease-Free State that differentiates between healthy and unhealthy older persons. It can be defined as a lifelong process enhancing opportunities for improving health and social, physical, and mental well-being, quality of life, independence and improving effective life changes. The World Health Organization (WHO) based healthy ageing on functional perspective and life course changes. It defines healthy ageing as “the process of developing and maintaining the functional ability that enables well-being in older age”. Where, functional ability is related to health attributes that facilitate persons to be and to do what they have reason to value. Functional ability includes relevant environmental characteristics, intrinsic capacity of individuals and interaction between them. These characteristics include person’s ability to think, work, remember and grow, meet basic needs, build, and to maintain relationships and contribute to society (WHO, 2015).

The process of demographic transition is also a major challenge in Pakistan. The life span in Pakistan has also increased irrespective of the economic and political instabilities. This fact is clearly evident from the rising population of older people. As of 2019, almost 15 million people are aged over 60 and it is 7% of the country’s entire population. The expected proportion of older people in 2050 is double to 12%, which means 40 million people are aged over 60. According to the ranking of United Nations Human Development Index in 2018, the Pakistan is ranked at 150<sup>th</sup> out of 189 countries. As it is predicted that life expectancy will rise above 70years, the issue of older population is becoming major concern for Pakistan<sup>1</sup>.

An increased ageing population created challenge to existing health care system because older people suffer from both communicable and non-communicable diseases due to their deteriorating immune system. The most common health issues of older people are infections, visual impairment, hearing, chewing, diabetes, arthritis, difficulty in walking and osteoporosis. In old age the people also face issue of financial resources and very small proportion of older people is receiving pensions. In Pakistan’s culture the older people are protected and compensated by the strong and unconditional family support but now the joint family system is breaking down into nuclear family system. This breakdown has serious effects on the health of older people. The joint family system protects the older people from the psychiatric illness like depression. Social and emotional support cannot be ignored in the life of older people (Qidwai, 2009).

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<sup>1</sup> HelpAge International, Ageing Population in Pakistan <https://ageingasia.org/ageing-population-pakistan/#:~:text=As%20of%202019%2C%20almost%2015,the%20demand%20for%20health%20services.>

Old age is itself a problem and it also has serious socio-economic implications for the societies. Sociologist explains why old age is deadly in four points. First of all, it prevents us from active employment; second, it weakens the body, third, it deprives us of almost all bodily pleasures and fourth, it is the near to death. The two more points can be added to this list i.e. economic insecurity, and loneliness. In real terms, social, physical, economic and psychological problems are linked with old age. A large number of the total labor force in Pakistan is employed in informal economy due to which a large proportion of the senior population is completely missing any coverage of pension or other type of social security scheme (Ashiq, U., & Asad, A. Z., 2017). This challenge of catering to the needs and coping with the demands of a rapidly increasing elderly population requires substantial improvements in the support base and systems of social security in Pakistan.

### **Objectives of the study**

The objectives of the study are:

- To explore the determinants of healthy ageing for older people in Pakistan
- To provide policy recommendations to relevant stakeholders

## **2. Literature Review**

The life expectancy of humans has increased rapidly throughout the whole world. From the last 200 years there is substantial increase in the life expectancy which is attributed to improved medical facilities, environmental changes including better living conditions, enhanced quality of food and water hygiene and reduction in impact of infectious disease with vaccination. Now more people are living long beyond the ages but the aged population faces different types of losses including loss of functions and high risk of suffering with the chronic diseases. Thus, the life expectancy has increased but the healthy life expectancy has not increased. Therefore, researchers have been started to develop indices as well as accessing different determinants of healthy ageing in order to compare the economic and social aspects of healthy ageing across the countries.

Initially, some researchers have found behavioral determinants of healthy ageing. They assessed that behavioral determinant have contribution in healthy ageing or not. Haveman (2003) pointed out that healthy lifestyle is positively related to the healthy ageing. The three indicators diet, physical activity and smoking habits of healthy life style have selected. The findings of the study showed that unhealthy life style like smoking, low quality diet and in active physical activity leads to increased mortality risk. The smoking person is more prone to deterioration in health status as compared to non-smoking person. A healthy lifestyle of older person is highly related to reduce mortality risk and declined health status. The Peel et al. (2005) also depicted that behavioral determinants are significantly associated with the healthy ageing. In this study, the concept of healthy ageing and definition of health which is given by WHO extends to physical, mental and social well-being. According to this concept and definition, the determinants of healthy ageing categorized into different factors including demographic, medical, psychosocial and behavioral. The determinants of healthy ageing are smoking status, consumption of alcohol, obesity, dietary intake and physical activity. The evidence of an association of healthy

ageing showed not smoking, being physically active, and maintaining weight within normal range and moderate alcohol consumption.

However, the behavioral patterns of older people are significantly related to healthy ageing. Therefore, the healthy ageing has assessed based on the Healthy Lifestyle Index, Psycho-social index and socio-economic status (Sowa et al., 2016). It has depicted that lifestyle index including sufficient consumption of fruits, vegetables, meals and moderate physical activity is positively related to healthy ageing. The Psycho-social Index includes employment, social participation and level of satisfaction is also positively associated with the healthy ageing. The Sadana et al. (2016) highlighted the three issues of adults health include health and social care, physical environment and social, political and economic context. These issues influence healthy ageing directly as well as indirectly through the vulnerability of citizens.

The national and local government has never adopted data on ageing population. The United Nations Population Fund (UNFPA) and HelpAge International published a report on “Ageing in the 21st Century” in 2012. Later on, the index named as Global Age Watch Index (GAWI) was constructed to compare the healthy ageing among different countries. The GAWI index has four domains which include 13 indicators. The index is calculated by taking the geometric means of normalized values of all the four domains. The all four domains carry equal weight. The value of each domain is also a geometric mean of all the indicator of all domains with the equal weights. The first domain of index is the income security which is described through the access of sufficient amount of income and its use independently. The indicators of income security are the pension income coverage, poverty rate in old age and relative welfare of older people. The second domain is health status and its indicators are life expectancy at age of 60, healthy life expectancy at age of 60 and psychological wellness. The third domain is employment and its indicators are employment and educational status of older people. Older people want to live independently and feel safe and secure in the environment. Due to which fourth domain is selected as enabling environment and the indicators of this domain are social connections, physical safety, civic freedom and access to public transport. The 91 countries are ranked globally with the GAWI index which is best to live in for the older people. Later in 2019, the GAWI was reformulated and developed new domain of gender inequality. The inclusion of gender inequality domain in GAWI depicted that it increases the specificity of the well-being measure (Atoyebi et al., 2019).

After the development of GAWI (2013), the Active Ageing Index (AAI) was developed (Zaidi, 2017). The four domains for the Active Ageing Index were selected. These domains are employment, participation in society, independent, healthy and secure life and capacity enabling environment for active ageing. Each domain has different indicators with their relative weights and these indicators are selected with the advice of AAI expert group which includes statisticians, academics and representatives of national and international organizations. All the indicators are measured on the same scale ranging from 0 to 100 where, 0 is for the least positive result in terms of active and healthy ageing and 100 is for the best possible result. The AAI calculated by taking the weighted sum of four domains and each domain is itself a weighted sum of the indicators included in each domain. The



indicator calculated for the 28 EU countries with the focus on older people. The finding shows that the Sweden, Denmark and Finland are on the top of the ranking in 28EU countries, whereas, the Central and Eastern European countries and Greece are at the bottom of the ranking. Further, the Healthy Ageing Index (HAI) was created in subset of six low and middle income countries. The study has used indicators of functional ability and intrinsic capacity. The mean and variance of adjusted weighted least square estimators used for the analysis of categorical data. A HAI with excellent psychometric properties was created by using items of functional ability and intrinsic capacity and it is recommended that further research is required to explore sub population differences and to validate this index to other cultural settings.

The reports of European Union also stimulated healthy ageing as priority policy. The EU described the healthy ageing as “it is the process to enhance the opportunities for the mental, physical and social life of older people so that they can participate actively in society without any discrimination and also enjoy healthy and independent life”. The Heuvel and Olariou (2019) have identified determinants of healthy ageing at national level. The indicators under the 3 aspects include vulnerability, social cohesion and resilience of healthy ageing, have assessed. The indicators of vulnerability at national level indicate the proportion of people at the risk of poverty. Social cohesion at national level describes the extent to which people are willing to accept each other. Resilience at national level represented the provision of health care services and social security for the people. The Principal Component Analysis (PCA) is used to explore the coherence between the indicators. In order to analyze the significant contribution of these three aspects into healthy ageing the linear regression analysis has used. The results depict that healthy ageing vary from 64.7 years to 80.3 years between the 31 European countries. The results also showed that resilience and vulnerability has significant contribution in healthy ageing. Cosco et al. (2017) explained that greater resilience can be adopted at population level and through the public policy intervention there is great potential to increase the social and environmental resources. The authors suggested that resilience should use as a public health policy and adopt greater resilience, which increases available resources to older people. Naah et al. (2020) depicted the determinants of active and healthy ageing in Sub Saharan Africa. The study explained three dimensions of active and healthy ageing i.e employment, community support and health and housing and living. It showed that income has positive impact on active and healthy ageing and there is no impact of education and health on active ageing.

Loneliness increases with the growing age and it is a negative feeling which occurs when a person’s social requirement are not fulfilled in their actual social relationships. The Coll-Planas et al. (2017) observed that promotion of social capital decreased the loneliness among the older people. If the social capital which includes social participation and social support is maintained then it has significant impact on the depressive symptoms.

From the above literature, it can be concluded that healthy ageing is highly associated with the behavioral, social as well as economic factors. A person, who takes healthy diet, actively participates in physical exercise and maintains weight is able to live healthy life. There are many challenges that older people face like loss of loved ones, unemployment and

independence. Therefore, in order to spend healthy life, the older people should participate in community, improve their diet and do physical activity. The Healthy Ageing Index also provides four aspects of health ageing which is income security, health status, employment and enabling environment. All the three aspects i.e. economic, social and behavioral are important to enhance healthy ageing.

### 3. Research Methodology

The intent of the study is to explore the determinants of healthy ageing for Pakistan. For the purpose, a survey has been conducted. Survey sample consisted of 450 adults aged 55 and above living in three major cities of Pakistan. Individuals were randomly selected from different areas of the city so that sample is representative of population from every social class.

This study has adopted Statistical methodology for construction of healthy aging score was Factor Analysis. Factor Analysis identifies the common variance amongst a set of observed variables (i.e., indicators), and creates a factor (i.e., index) comprised of that common variance. Indirect measurement of latent constructs requires formal assessment of reliability and validity. The dimensions of the data are examined and validated through Confirmatory Factor Analysis (CFA). Traditional guide for factors with Eigen value greater than 1 suggests two factors, a two-factor solution was chosen for the analysis. To build a CFA model we have three latent factors related to healthy aging, each latent factor is not directly measured. Model was then estimated using maximum likelihood estimates. Selection of variables is based on literature; Table 1 contains the details of variables used as input to Confirmatory Factor Analysis. To calculate a metric of healthy aging, Bartlett scores were calculated, these scores are unbiased estimates of the true factor scores (Hershberger, 2005).

*Table 1: Domains and Variables of Healthy Ageing*

Domains	Variables
Socio-Economic Situation	<ul style="list-style-type: none"> <li>• Employment status</li> <li>• Property ownership<sup>2</sup></li> <li>• Autonomous income<sup>3</sup></li> </ul>
Physical Health	<ul style="list-style-type: none"> <li>• Daily Activities (Walk, Exercise, Meeting family and friends)</li> <li>• Functional Disabilities (Hearing, Seeing, Communication, Remembering/Concentrating, walking/Climbing stairs)</li> </ul>
Psychological Health	<ul style="list-style-type: none"> <li>• Suffering from medically identified mental health problem</li> </ul>

<sup>2</sup> Survey question: Do you have any asset/property in your name? a) Never had any b) transferred to children c) still have possession.

<sup>3</sup> Construction of the variable “Autonomous income” only include those who have the earning sources (pension, rental income, salary, agriculture, investments, social assistance) which they freely govern by themselves.

Social Integration	<ul style="list-style-type: none"> <li>• Participation in volunteer activities</li> <li>• Participation in social gathering</li> </ul>
Discrimination & Abuse	<ul style="list-style-type: none"> <li>• Take part in household decision making</li> <li>• Age discrimination</li> </ul>

Fit indices of the model are given in Table 2 the final model is absolute fit in terms of RMSEA and SRMR and GFI values, whereas the CFI is quite lower to the cutoff point of 0.9.

*Table 2: Model Fit Indices*

	Chi sq(df)	p-value	CFI	RMSEA	SRMR	GFI
18 item-2 factor Model	305.9(125)	<0.001	0.66	0.08	0.07	0.87

To get Healthy Ageing Index, predicted values of CFA model were extracted where factor loadings were treated as regression estimates.

*Table 3: Two Factor Model of Healthy Ageing*

<b>Variables</b>	<b>Factor 1</b>	<b>Factor 2</b>
Employment Status	0.355	--
Physical Health: Walk	0.541	--
Physical Health: Meeting Neighbors/Friends	0.329	0.157
Physical Health: Meeting Relative	--	0.116
Physical Health: Exercise	0.357	0.172
Functional Disability: Hearing	0.567	0.111
Functional Disability: Seeing	0.530	0.132
Functional Disability: Communication	0.164	0.701
Functional Disability: Remembering/Concentrating	0.555	0.282
Functional Disability: Walking/Climbing Steps	0.723	-0.111
Medically Identified Mental Health Issue	--	-0.232
Residential Status	0.155	--
Participation in Volunteer Activities	0.191	--

Looking after grand children	0.371	-0.413
Household Decision Making	0.101	0.210
Property Ownership	-0.109	-0.278
Autonomous Income	0.103	0.200
Age Discrimination	0.203	--
<b>Note: Two-factor solution corresponding to CFA conducted on the sample of people aged 55 and above (n = 450): factor loading estimates after varimax rotation.</b>		

To quantify the importance of variables in predicting healthy ageing in old age, Mean Decrease Accuracy (MDA) was estimated through Random Forests. Random Forests is a machine learning technique that can handle non-linear numeric and categorical predictors and outcomes. Mean Decrease accuracy can be calculated through,

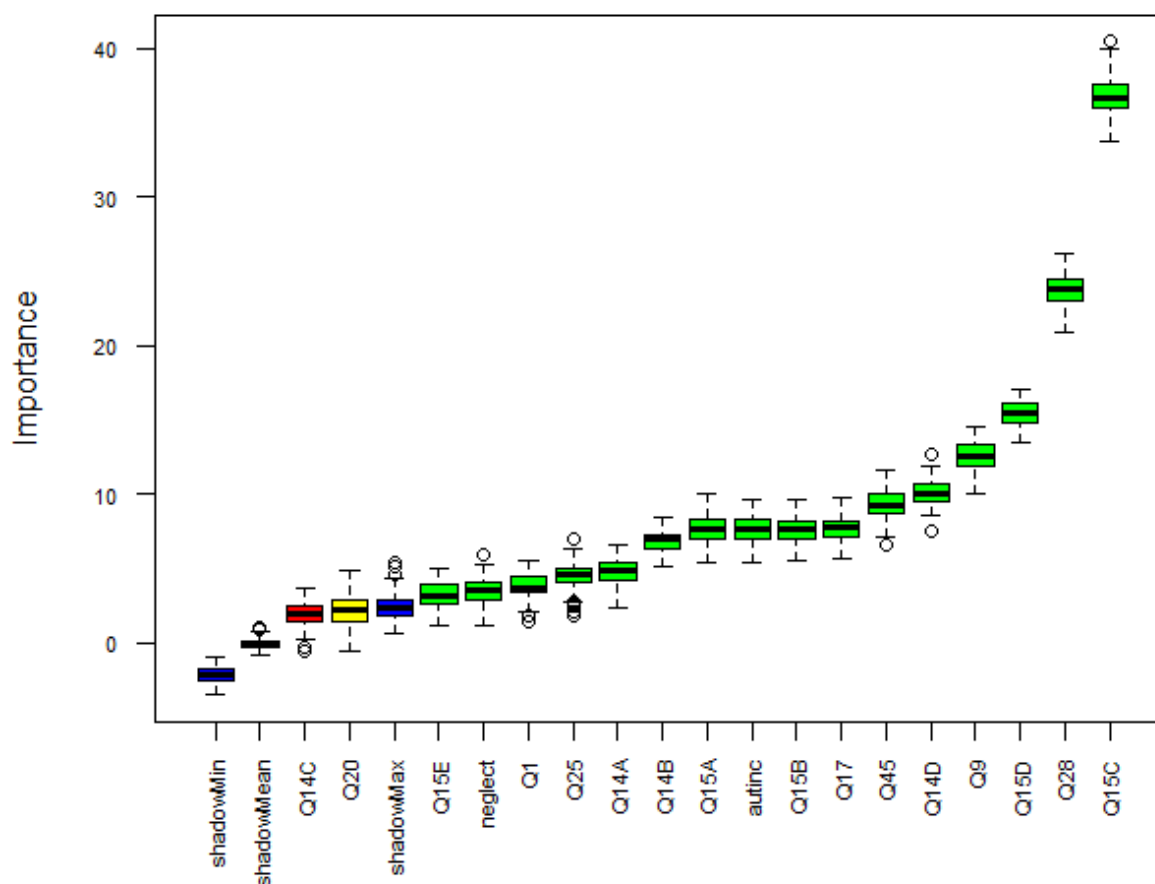
$$VI(x_j) = \frac{1}{n_{tree}} \sum_{t=1}^{n_{tree}} \frac{\sum_{i \in OOB} I(y_i = f(x_i)) - \sum_{i \in OOB} I(y_i = f(x_i^j))}{|OOB|}$$

MDA is also called permutation importance. This is because when a decision tree is created based on a set of learning datasets divided through subsampling, the intuition behind permutation has an importance that is not a useful feature for predicting an outcome. OOB (Out-Of-Bag) is one of the subsampling techniques to calculate prediction error of each of the training samples utilizing bootstrap aggregation. MDA is the method that calculates variable importance by permutation and the method uses OOB to divide its sample data. In other words, OOB estimates more accurate prediction value by computing OOB accuracy before and after the permutation of variable  $x_j$  and compute the difference.

Since  $t \in \{1, 2, 3, \dots, n_{tree}\}$ , the variable importance of  $x_j$  in tree  $t$  is the averaged value of the difference between predicted class before permuting  $x_j$ , which is  $y_i = f(x_i)$ , and after permuting variable  $x_j$ , which is  $y_i = f(x_i^j)$ , in certain observation  $i$  (Hur, J.H., Ihm, S.Y. & Park, Y., 2017). Results of the algorithm to quantify variable importance are shown in fig: 1.

*Figure 1: Relative variable importance in prediction of healthy ageing (variables values greater than shadowmax value are significantly important in predicting healthy ageing)*

## Variable Importance



### 4. Results and Discussion

Results of the analysis shows that functional difficulties (seeing, hearing, communication, remembering/concentrating, walking/climbing stairs) impact healthy ageing the most. As old age is associated with functional decline, it should be identified at an early stage. This will help bring proper interventions to ensure healthy ageing.

Social Participation refers to meet friends/family/relative and participating in social gatherings. Older adults are at higher risk of undesirable health effects combined with social isolation and loneliness. Social participation has been found to be related to better functional skills and well-being. Third important determinant of healthy ageing is property ownership. This is correlated to older people participating in household's decision making. Results suggest that those older people who keep the ownership of their property feel less discriminated and take their decisions on their own. On the other hand, age discrimination is positively correlated to those who either do not have any property or transferred their property to children. Activities such as walk/exercise works as medicine for older people. These daily life activities play a very important role in prevention of diseases and promote

healthy ageing. Physical fitness encourages elderly in old age to volunteer for community work which increase their level of satisfaction in life.

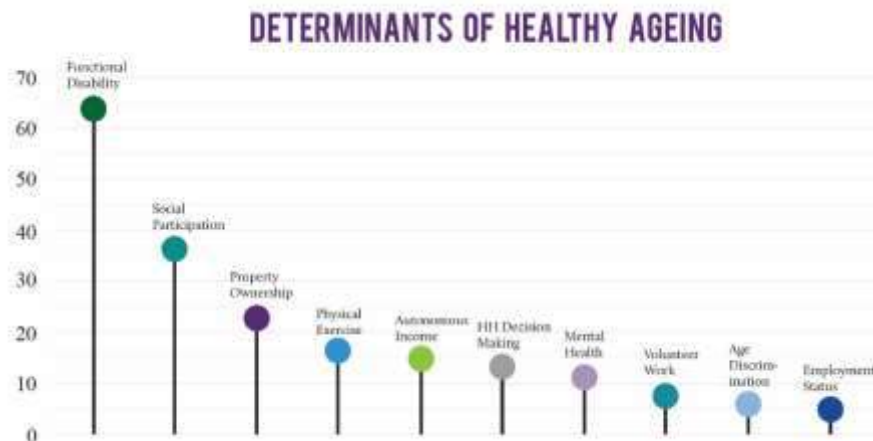


Figure 2: Determinants of Healthy Ageing in Pakistan

## 5. Existing Government Policies and Laws

The government of Pakistan has been making efforts to develop policies and laws for the rights of the older people. After the 18<sup>th</sup> amendment, the provincial government has made more progress in this regard. The three provinces Khyber Pakhtunkhwa, Sindh and Baluchistan have developed law for the senior citizens. These laws focused on the creation of medical facilities and facilities of social interaction which ultimately promotes the healthy ageing. These laws also focused on the basic needs of the older people which include the financial support and concession in road transport and other factors which helps them to move from one place to other very easily. The government of Pakistan had also developed policy on the better health care system to promote the health of older people. This policy was very comprehensive and it focused on the health care of geriatrics but unfortunately this policy has not been passed by the parliament. These laws also include the commitment of the state to formulate the policies for the welfare of older people.

The older people need protection such as assistance to deal with property ownership, insured health care and income security. Government can promote healthy ageing with the provision of social protection. Social protection covers the three areas such as social assistance, social insurance and social security. Government can enhance spending of older people to meet their basic needs through the increase in pension coverage. The government can also play role in promoting the social participation of older people by creating social groups and community events. A very smaller proportion of older people are receiving assistance from the government. Government need to increase the coverage of older people so that older people can be taken care of in a better way. The coverage of social assistance provided to older people from the social protection institutes such as Benazir Income Support Program (BISP), Zakat and Usher, and Bait-ul-Mal also need to expand.

## 6. Conclusion

The ratio of aged population with respect to total population is increasing with the passage of time. The health of growing number of older people is an economic issue/ challenge. It is also an opportunity for the older people to live with good health for longer period of time and contribute socially, economically and culturally in community. Due to the ageing of the body's immune system the older people suffer from the degenerative and communicable diseases. The most common health related issues of older people are infections, visual impairment, hearing, chewing, diabetes, arthritis, difficulty in walking and osteoporosis. Therefore, with the increase in life expectancy of population there is needed to enhance and promote the health of older people.

This paper is exploring the determinants of healthy ageing of older people in Pakistan. For this purpose the five domains of healthy ageing were selected. These domains are socio-economic situation, physical health, psychological health, social integration and discrimination and abuse. Each domain has different indicators. The common variance among the set of indicators is identified by the Confirmatory Factor Analysis. After the application of CFA the Mean Decrease Accuracy was estimated to quantify the importance of variable in predicting health ageing of older people.

Based on the findings of this study the three determinants are strongly associated with the healthy ageing in Pakistan. These include functional disability, social participation and property ownership. From the three, the functional disability is highlighted as the most essential determinant of healthy ageing. This is explained by the fact that old age is associated with the functional disability and if it is diagnose at early age then it can ensure better health of older people. Although the social participation represents an important factor of healthy ageing but a majority of older population do not participate in social and community activities. Therefore, the targeted interventions are required to promote social participation of older people. The third significant factor of healthy ageing is property ownership. The healthy ageing may be promoted by the governmental investment in provision on health care, social security and insurance.

## 7. Policy Recommendations

Based on the results of this study, following policies are needed to be adopted for healthy ageing for older people:

- The development of cost effective gerontology units are required to address the issues of older people. The health assessment of older people needs to be done on regular basis at early detection of condition to avoid the severity of the problem.
- The gerontology and geriatric medicine is a prerequisite for the provision of effective services for the older people. So the trainings and education on gerontology and geriatric medicine for the relevant group of professionals need to be enhanced.
- The older people mostly do not participate in social activities in Pakistan due to the lack of facilities and opportunities. It can be enhanced with the role of institutions, government and community collectively through the construction of parks and senior fitness centers. There is also need to organize events and form groups at community level for the older people especially for the female because the older females are less participated in social activities than the older male.
- In order to enhance the longer employment of older people, there is need to reduce incentives of early retirement and appreciate longer working lives.
- There is need to promote age diverse work cultures for the longer employment. There are cultural taboos that people cannot work after the age of retirement or their work is not appreciated. So in order to promote the employment in longer time, the demand side barriers are need to be tackled.
- As the older people face the loss of job and income, so there is need to enhance the financial assets or resources of older people to meet their basic needs. The coverage of social assistance institutions liked BISP, PBM and Zakat and Usher also need to increase. The coverage of pensions and social security services also need to expand because it will help older people to live independently.
- If the older people do not have property ownership, they are discriminated and neglected in their family as well as in community. So there should be proper legislation related to rights of property ownership of older people i.e. the children cannot own the property of their parents forcefully.



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